

# Conducting an Exploration Focused Astronaut Job Analysis

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# Disclosure Information

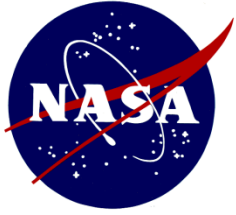
*85<sup>th</sup> Annual Scientific Meeting*

*Albert W. Holland, Ph.D.*

*William B. Vessey, Ph.D.*

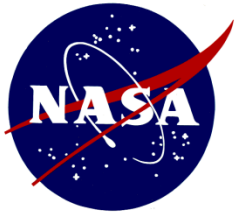
*Jamie D. Barrett, Ph.D.*

We have no financial relationships to disclose.



# Project Drivers

- NASA now embarking on multiple, one-year missions on ISS
  - 5 one-year missions currently on the books through 2024
- Addition of short (30-45d) missions to ISS likely with advent of US commercial crewed vehicles.
- ISS operations are approved through 2024
- Post-ISS, the potential mission profiles are diverse & uncertain
  - Near-Earth asteroids, Moon, Lagrangian points
  - Mars is the eventual exploration target



# Project Drivers

- In ISS era, NASA must be able to man 1mo, 4-6mo, and 12mo missions in real-time communications
- Post-ISS, potential missions are up to 12mo real-time comm and up to 36mo lagged comm
- Behavioral selection and training guidelines for new astronauts must be updated to accommodate new and potential mission profiles
  - Prior guidelines developed in 1996 and 2003 for shorter-duration ISS and Shuttle missions
- Large pool of flyers with long-duration experience available now to be SMEs



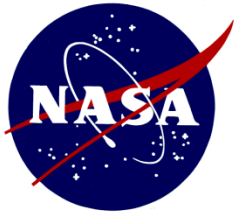
# Participants

- Internal Behavioral Team
  - Al Holland/NASA
  - Jamie Barrett / Wyle Life Sciences
  - Brandon Vessey / EASI
- Astronaut Core Panel (assigned by Astronaut Office)
  - 6 veteran US astronauts
  - Sounding board for behavioral team
- 23 prior ISS astronauts and 3 veteran behavioral specialists from the operational group
- External Technical Advisors
  - Edward Levine / University of Southern Florida
  - Fred Morgeson / Michigan State University



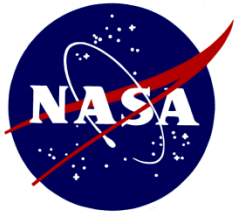
# Objectives

- Identify, define and weight the behavioral competencies (knowledge, skills, abilities and characteristics) for upcoming space mission profiles
  - Utilize a systematic, best-practices job analysis procedure
- Increase the accuracy of the competencies by utilizing the large number of veteran US ISS flyers as SMEs
- Deliver a reference document useful to operational selection, training and to research



# Competencies

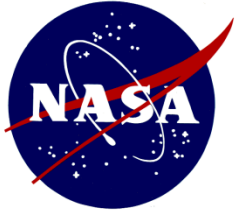
- Describe the knowledge, skills, abilities and other behavioral characteristics desired in order to maximize the likelihood of mission success
  - E.g., teamwork, group living skills, independence, mechanical inclination
- Vary somewhat or may be prioritized differently according to the mission profile (duration, habitable volume, lagged comm, etc.)
- Guide the choice of tools and methods used in selection



# Method

- Review of the new ISS 12mo and post-ISS potential missions led to 4 general ‘types’ of missions:
  - A: up to 6mo duration, RT comm, larger vol
  - B: up to 12mo duration, RT comm, larger vol
  - C: up to 12mo duration, lagged comm, small vol
  - D: up to 36mo duration, lagged comm, small vol
- Core Panel of 6 veteran astronauts formed and reviewed mission types A-D; group-generated initial competencies for A-D.





# Method

- Individual 1.5h interviews with 26 SMEs:
  - Reviewed & discussed the 4 classes of missions and their characteristics
  - SME gave best judgment on competencies needed for each class A-D; discussed each competency and why important; how mission demands similar and different A-D
  - Reviewed previously-contributed competencies A-D, discussed them, added/modified them



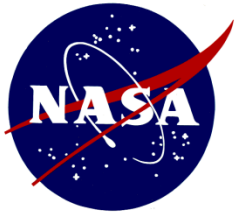
# Method

- Detailed behavioral descriptors and competency suggestions were grouped by similarity into:
  - 18 final competencies
  - 3 general types (Mission-related, social, and personal competencies)
- For each final competency, key descriptors were identified and a definition was formed, based upon interview results



# Method

- A second Core Panel meeting:
  - Reviewed the competency list in detail
  - Suggested edits regarding definitions, key descriptors, and operational examples
  - Advised regarding upcoming survey design
- External job analysis experts periodically reviewed and advised on the process and the structure of the competencies



# Sample of Competencies

- **Operations Orientation**
- Definition: *Maintains a pragmatic focus on mission goals and constraints*
- Descriptors: Scanning, forecasting, backs away from details as needed, awareness of priorities and able to execute, compartmentalizes tasks, outcome oriented, pragmatic, shifts with changing goals, maintains situational awareness, anticipatory thinking to better coordinate with ground activity, problem-solving mindset, keeps tools and work materials clean and organized, appropriately balances action with analysis



# Sample Competencies

- Autonomous Worker
- Situational Leadership and Followership
- Small Group Living
- Teamwork
- Adaptability/Stress Tolerance



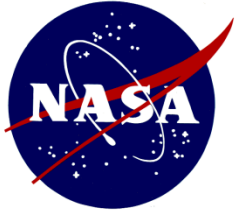
# Method

- Now implementing a web-based exercise for previous SMEs and previously-unavailable veteran flyers to:
  - Assign weights/priorities to the competencies, based on frequency and criticality, for each mission type
  - Provide rationale for weightings



# Method

- Analyze the ratings and rankings
- Identify the most critical competencies for each mission profile
  - Importance relative to one another, with rationale, examples, constraints, and definitional nuances
- Final Core Panel Meeting to review findings
- Publish a document describing the process, analyses, findings and recommendations



# Questions?





# Project Plan

- ✓ 12/13 Management input and approval
- ✓ 12/13 Initial Core Panel Meeting
  - Generate initial list of competencies for 4 mission types
- ✓ 01-03/14 Individual Interviews with Previous ISS Flyers
  - Discuss the 4 mission types, independently generate critical competencies for each, review and add/delete as needed
  - How do their definitions change across mission profiles?
- ✓ 04/14 Second Core Panel Meeting
  - Review and edit competencies from interviews, generate behavioral examples
- 05/14 Individual, web-based Survey (all prior SMEs and any others previously unavailable)
  - How prioritize/weight the competencies by mission type?
  - Criticality, frequency, additional comments
- 06/14 Final Core Panel Meeting
  - Finalize list, definitions, weights